

## THE LIFE HISTORY OF *ZETONA DELOSPILA* (WATERHOUSE) (LEPIDOPTERA: LYCAENIDAE)

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### Abstract

The early stages of *Zetona delospila* (Waterhouse) are described from northern Queensland. Larvae feed at night on hemi-parasitic vines, *Cassytha filiformis* L. in Queensland and *C. glabella* R.Br. in coastal Western Australia, which grow over tussocks of *Triodia* or *Spinifex*. The distinctive pupal morphology provides support for the species current placement within the Candalidini. Egg and larval morphology and the food plants of *Z. delospila* suggest a close relationship to the *Candalides* (*Erina*) group of *Cassytha*-feeding species.

### Introduction

*Zetona delospila* (Waterhouse) is an uncommon butterfly confined to the dry tropical region of northern Australia. It has a wide, sporadic distribution with most records from the far north-west, where it ranges from Broome and the Edgar Range south-west of Kimberley to the Ord River at Queens Islet in Western Australia (Common 1981, Common and Waterhouse 1981, Dunn and Dunn 1991). In Queensland the species is known from five disjunct areas: (1) 30 km W of Fairview (Monteith and Hancock 1977); (2) Porcupine Gorge National Park 70 km NW of Hughenden (Valentine 1981, Valentine and Johnson 1982); (3) 9 km WSW Torrens Creek and on the Burra Range 18 km ENE of Torrens Creek about 140 km SW of Charters Towers (Braby 1994); (4) on the Selwyn Ranges at Mt. Elliot Mine approximately 140 km SE of Mt. Isa (1 ♀, 5.iii.1993) and at Selwyn Mine approximately 160 km SE of Mt. Isa (1 ♂, 20.iv.1993) (T.A. Woodger, pers. comm.); (5) Johnson Creek about 70 km NW of Mt. Isa (2 ♂♂, 2 ♀♀, 18.v.1993) (A. Eggleton, pers. comm.).

Adults of this distinctive lycaenid fly close to the ground amongst grass and low shrubs (Common and Waterhouse 1981), often in open sandy areas or on sandstone escarpments among clumps of spinifex (*Triodia*). The early stages and general biology have not been reported. The purpose of this paper is to document the life history, summarise available information on its biology and comment on its taxonomic relationships with related Candalidini. Most of the work described here is based on observations made on or near the Burra Range (20°43'S, 145°10'E) in northern Queensland during 2-3.v.1992 and 13-14.v.1993.

### Early Stages

**Food plants.** *Cassytha filiformis* L. in Queensland (Voucher: Braby AQ 625005, Queensland Herbarium Indooroopilly), *C. glabella* R.Br. in coastal Western Australia (Lauraceae).

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*Egg* (Fig. 1). Hemispherical, whitish-grey, surface deeply pitted; ridges of pits widely spaced, pits approximately hexagonal in shape; micropylar area depressed. Diameter 0.6 mm, height 0.4 mm.

*Final instar larva* (Fig. 2). Thorax and abdominal segments 1-6 with red middorsal line and a broad whitish-yellow subdorsal band, edged below by a dark purple dorsolateral band; lateral surface green with a faint yellow ventrolateral line. Abdominal segments 7-10 green with pronounced reddish-purple middorsal line and a faint reddish-purple dorsolateral line; Newcomer's organ present on segment 7 but weakly developed; raised areas on segment 8 but organs not everted. Prothoracic and anal plates green, somewhat flattened; segments 9-10 narrower than segments 7-8; abdominal segment 10 distinctly U-shaped posteriorly. Head light brown, hidden beneath prothorax. Body with numerous light brown setae; spiracles light brown. Length 11-12 mm.

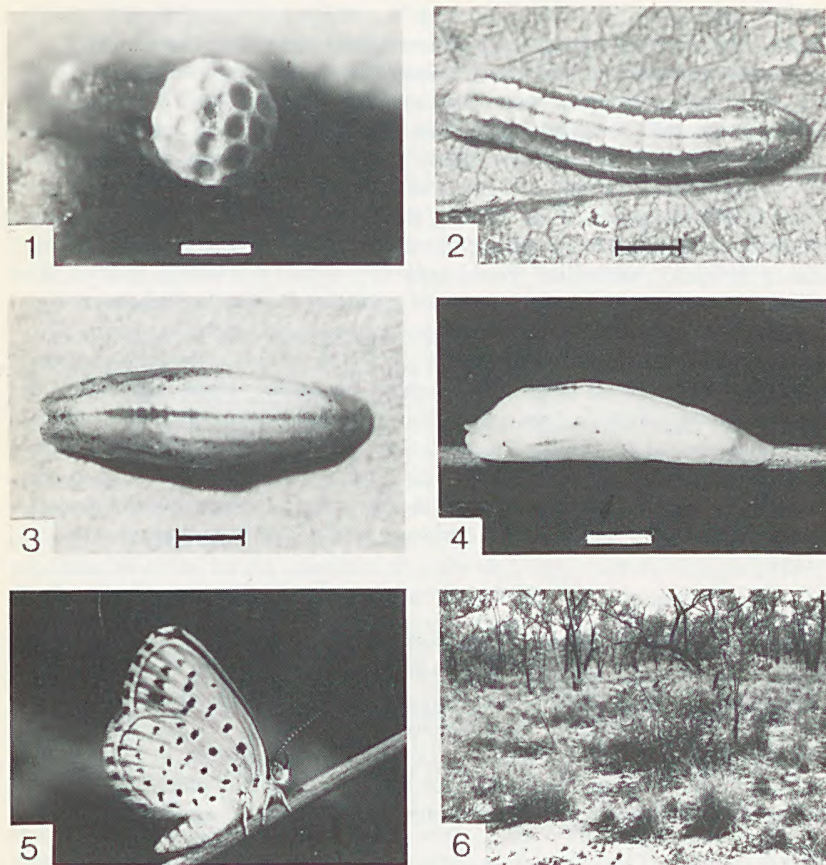
*Pupa* (Figs. 3, 4). Elongate, pale cream-yellow with scattered small black dots, especially on head and thorax. Head and abdomen with weakly developed lateral flanges. Thorax with weakly developed dorsal ridge. A dark reddish-brown middorsal line on head, thorax and abdominal segments 1-7, more pronounced on metathorax and abdominal segments 1-2. Abdominal segments with pink dorsolateral line edged above white; wings with series of faint black longitudinal lines; two variable black lateral spots or patches on abdominal segments 1-2. Spiracles black. Attached to silken pad by anal hooks and central girdle. Length 10 mm, width 3 mm.

### Observations

On the sandstone plateau of the Burra Range *Z. delospila* was limited to open areas which supported eucalypt woodland and a fairly dense ground cover of *Triodia pungens* R.Br. (Spinifex or Porcupine grass) (Fig. 6), upon which the food plant grew as a hemi-parasitic vine. Within these areas *Cassytha filiformis* occurred in relatively discrete dense patches, but elsewhere it did not appear to be common. Adults collected from the Selwyn Ranges, western Queensland, also were observed flying over patches of *Cassytha* that were parasitic on *Triodia pungens* (T.A. Woodger, pers. comm.). On the Burra Range *Z. delospila* occurred together with the more abundant *Candalides geminus* Edwards & Kerr and *C. erinus* (Fabricius), which was scarce. The early stages of *C. geminus*, however, were only located on the larger vine *Cassytha pubescens* R.Br.

On the Burra Range eggs of *Z. delospila* were found singly on the flower buds and young shoots of the food plant; on 3.v.1992, at 1100 h, a female was also observed to deposit an egg beneath the stem of the food plant which was tightly wrapped around a leaf of *Triodia*. Near Cable Beach, Broome, Western Australia, females were observed (on 20.v.1981) ovipositing on the flower buds and new growth of *Cassytha glabella* which was parasitising





**Figs. 1-6.** Life history of *Zetona delospila*: (1) dorsal view of egg; (2) dorsal view of final instar larva; (3, 4) dorsal and dorsolateral views of pupa; (5) adult female; (6) habitat at the Burra Range. Scale = 0.3 mm for Fig. 1; 2.0 mm for Figs 2-4.

*Spinifex* (D.P.A. Sands pers. comm.). On the Burra Range larvae were collected during the day by shaking clumps of *Triodia* which supported dense clumps of the food plant. In captivity the larvae fed only at night; during the day they possibly hide deep within the *Triodia* tussocks. Larvae were not attended by ants. Two pupal shells (both parasitised) were found attached to the stem of a small shrub festooned with the larval food plant: both pupae were orientated in an upright position and situated about 10 cm above the ground. No pupae were found amongst the leaf litter and debris despite extensive searching, although D.P.A. Sands (pers. comm.) located an empty pupal case in a stiff curled leaf near Cable Beach, Western Australia. In captivity, the duration of the pupal stage varied from 13 to 16 days ( $n=2$  ♀).

Adults (Fig. 5) were locally abundant on the Burra Range and nearly all specimens captured on 13-14.v.1993 were in fresh condition. They flew close to the ground, usually in close proximity to the food plant. Their flight was generally weak and somewhat resembled that of *C. erinus*. Adults were most active around midday, but only during sunny periods. During the early hours of the morning and late afternoon they were very inactive and settled mostly on stems of the *Triodia* tussocks for relatively long periods. Sun basking was observed during the cooler hours of the morning (from 0900 to 1000 h); butterflies would typically open their wings at 90-135° towards the sun whilst settled on small plants and other herbage near the ground. Females were apparently more numerous than males during 13-14.v.1993 (sex ratio of total captures: ♂/♀ 1:5, n=24). Butterflies were recorded feeding from a range of flowers: at Porcupine Gorge near Pyramid Lookout I took a female feeding on flowers of *Bursaria incana* Lindley (Pittosporaceae) at 1500 h on 1.v.1992; near Torrens Creek two adults were taken on flowers of *Waltheria indica* L. (Sterculiaceae) at 1045 h on 2.v.1992; and on the Burra Range both sexes were feeding commonly on flowers of *Cassytha pubescens* in company with *Candalides geminus* on 2-3.v.1992.

## Discussion

*Z. delospila* has a rather disjunct distribution and until quite recently very few specimens were known; the species was considered rare by Common and Waterhouse (1972). Its patchy occurrence may reflect the patchy distribution of suitable food plant-grass associations (i.e. *Cassytha-Triodia/Spinifex*), particularly since many of these associations are confined to sandstone escarpments and open sandy areas which tend to be spatially patchy in nature. Moreover, within these habitats colonies of *Z. delospila* appear to be very localised.

In addition, *Z. delospila* appears to be quite seasonal and this also may partly account for the paucity of records. The known (combined) flight period is from March to August with one record from the Northern Territory in October (Monteith and Hancock 1977). Adults were not flying on the Burra Range in summer despite extensive searching during 12-13.ii.1994, although much of the habitat had been recently destroyed by fire. In Queensland, most sightings/captures have been in late autumn-early winter; in June 1977 on the *Triodia*-covered sandstone outcrops near Fairview (Monteith and Hancock 1977), in May 1980-81 at Porcupine Gorge National Park (Valentine 1981, Valentine and Johnson 1982), in May 1993 on the Johnson Creek north-west of Mt. Isa (A. Eggleton pers. comm.). Appearance of many fresh specimens in May 1992/93 at the Burra Range suggests the main emergence occurs in autumn.

The species *delospila* currently is placed in the monotypic genus *Zetona*, erected by Waterhouse (1938) after a long period of generic confusion. In his



original description of the species, Waterhouse (1903) provisionally placed *delospila* under *Zizera* Moore based on a single female, but noted that it was quite distinct from any described species that belonged to the 'grass-blues'. Waterhouse (1938) later suggested that *Zetona* may be related to *Lucia* Swainson, based on the superficial resemblance of the cell spots of the wing underside, but only five specimens were available then for comparison. Common and Waterhouse (1972) felt *Zetona* was still related to *Zizeeria* Chapman, *Zizula* Chapman and allied genera, but in a detailed study Eliot (1973) showed that the wing venation and male genitalia of *Zetona* were more closely related to *Candalides* Hübner sens. lat. and he placed the genus in the newly erected tribe Candalidini.

Evidence reported here on the early stages of *Z. delospila* clearly supports Eliot's view, particularly the shape and form of the pupa which is perhaps the most distinctive feature of the tribe. The pupae of these species are characterised by several features: (1) a lateral flange on the head, which may be strongly indented in the middle; (2) a lateral flange on the abdomen, which sometimes is upturned; (3) usually with a dorsal ridge on the thorax and abdomen; and (4) often with a pair of dorsal projections on the thorax. *Z. delospila* shares many of these characters, although the dorsal ridge is less pronounced on the thorax (and absent on the abdomen) and the flanges are not as strongly developed as in most other members, for example *Candalides cyprotus* (Olliff) (Atkins and Heinrich 1987). The pupal shape of *Z. delospila* somewhat resembles that of *C. acastus* (Cox) (see Fisher 1978, Fig. 81e), which is also elongate with a relatively narrow abdomen. Structurally, the pupa is perhaps closest to *C. geminus* which also has the lateral flanges less pronounced and the dorsal ridge weakly developed compared with *C. hyacinthinus* (Semper) and *C. erinus* (Braby unpubl. data).

The association of the early stages of *Z. delospila* with *Cassytha* spp. also indicates an ecological relationship with other members of *Candalides*, particularly those of the *Erina* Swainson species group (Tite 1963) which feed as larvae exclusively on *Cassytha* (e.g. Common and Waterhouse 1981, Fisher 1978). The early stages of *Z. delospila* are also very similar in morphology to these species. For example, the egg closely resembles that of *Candalides geminus* (which has the same shape and pit structure but is considerably larger, about 0.8 mm dia. (Braby unpubl. data)), but differs quite substantially from those of *Nesolycaena albosericea* (Miskin) and *C. absimilis* (Felder), both of which have triangular shaped pits with raised blunt projections at the pit junctions (Sands 1971, Braby unpubl. data). The larva of *Z. delospila* is rather colourful and similar in pattern to *C. geminus*. However, unlike *C. geminus*, *Z. delospila* lacks the raised dorsal reddish spots on abdominal segments 1 to 6 and does not possess the distinctive broken white dorsolateral line on the thoracic segments and abdominal segments 1 to 6 (Edwards 1980). Larvae of these two species are more brightly coloured than those of *C. hyacinthinus*, *C. erinus* and *C. acastus* which are green and less conspicuously striped.

Until a detailed comparative study is undertaken on the Candalidini, particularly the *Erina* (*Cassythia*-feeding) species group, *Z. delospila* is best retained in its current (separate) genus for the present.

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